

Environment, Safety, and Health Division

1996 Science, Technology, and Support Activities Self-Assessment

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INTRODUCTION

In 1994 and 1995, ESH Division submitted a Divisional self-assessment for incorporation into the Laboratory's Science and Technology Assessment Report (STAR). In 1996, the Division is assessing its performance for the period July 1, 1995 through June 30 1996, except for publications, which cover the 1995 calendar year. The four assessment criteria specified by the University of California (UC) are

- (1) Quality of Science and Engineering
- (2) Relevance to National Needs and Agency Missions
- (3) Performance in the Construction and Operation of Major Research Facilities
- (4) Programmatic Planning and Performance

The Division has developed specific performance measures for each criteria as it pertains to environment, safety, and health (ES&H) operations. To create a concise report, we have highlighted selected examples of the Division's 1996 science and technology accomplishments, provided detail in the appendixes, and omitted routine items.

In addition to addressing UC's four criteria, the Division also reports on its follow up to last year's customer survey of its health and safety programs. This survey was used to assess performance and assist in identifying opportunities for improvement. A similar survey of environmental programs is in progress.

The 1996 self-assessment is a management tool for evaluating achievements, planning progress, establishing future tactical and strategic goals, and establishing baseline tracking of performance measures. Self-assessment will assist the Division as it drives to focus more strongly on ES&H science and technology. Also, the self-assessment provides information about ESH Division's activities and interactions with other Laboratory organizations, the Director of the Laboratory, UC, and other external organizations.

This ESH Division self-assessment report includes an organizational summary and one section for each UC criteria. Two appendixes accompany the report: appendix A contains the Division's mission statement, an organizational chart, and a detailed organizational summary of each group, team, and office; appendix B is a complete summary of published works, presentations, involvement in professional organizations, and contributions to science education.

ORGANIZATIONAL SUMMARY

ESH Division provides leadership and guidance to the Laboratory in the areas of worker, public, and environmental protection by ensuring that operations are conducted safely and efficiently. To achieve these objectives, Division groups develop and apply science and technology in concert with Laboratory programmatic organizations or as an independent activity to solve Laboratory or national environment, safety, and health (ES&H) problems. Primary responsibility and accountability for ES&H resides with Laboratory line managers.

The importance of ESH Division in scientific research and technical development, as well as in facility management, is that it provides critical expertise for Laboratory operations. The Division enables employees to work in compliance with ES&H regulations, assisting them to work safely and helping them to meet high legal and ethical standards within their organizations' programs. Division staff provide technical, operational, and management expertise to meet and support all Laboratory organizations' specific scientific and technical goals. Division ES&H professionals support the Laboratory's mission, thereby enabling overall excellence in science and technology.

ESH Division's programs complement the Laboratory's science and technology activities through organizational partnering, evaluation and interpretation of regulatory compliance issues, and research and development in ES&H. The Division employs a cadre of experts in ES&H regulations and requirements; our organizational structure enables efficient and professional partnering with other organizations. ES&H generalists and specialists operate out of a central core, partner with Laboratory organizations, and become integral to effective and safe operations. Their task is to assist informed decisions that help managers meet program goals.

Our Division's applied research and development program provides unique operational tools to enhance science and technology throughout the Laboratory, the DOE complex, and the national scientific community. Examples of ES&H research and development activities include

- state-of-the-art continuous air monitor (CAM)—this activity includes industrial partnering and technology transfer
- environmental-monitoring instrumentation development
- personnel radiation dosimetry development
- nuclear accident dosimeter development
- high-energy neutron dosimeter development
- worker respiratory protection technology and heat stress-monitoring technology development—this activity includes technology transfer
- emergency instrumentation and mitigation technology development
- Bayesian statistical analysis of internal dosimetry data and development of analytical methods
- radiological environmental emission-sampling techniques
- storm water flow instrumentation development

- biostatistical measurements of hantavirus risk
- wildlife global positioning and tracking instrumentation application
- cost-risk-benefit analysis and prioritization modeling
- inspection of Laboratory-procured materials to uncover fraud or the procurement of counterfeit items

ESH Division management has organized the Division into sixteen groups, five offices, and four project teams, all of which report to the ESH Division Office. An organizational chart and description of the responsibilities and activities of each group, office, and team appear in appendix A, which complements this brief overall organizational summary.

During this self-assessment period, two teams were closed out (Human Studies and Order Compliance and Self-Assessment); the Facility Risk Management Group (ESH-3) incorporated the Technical Support Team into its functions; and the Division formed three new teams (Service Delivery, Information Management Systems, Standards Project) as part of reengineering. The Service Delivery Team is the architect for development of services. The team has been successful in fielding deployed ES&H teams to three divisions—Chemical Science and Technology (CST), Facilities, Security and Safeguards (FSS) (primarily the Facility Project Delivery Group), and Engineering Sciences and Applications (ESA). The Information Management Systems Team cuts across all disciplines to improve information exchange among various organizations throughout the Laboratory. Currently, this team is improving the form and transmission of data for more accessibility and easier interpretation. For example, they are making on-line external dosimetry information available to both workers and managers. The Standards Project Team works to optimize and continuously improve safety and cost-effectiveness of Laboratory operations through an integrated management system based on necessary and sufficient standards.

In April 1996, ESH Division had 800 full-time equivalent employees, a decrease from 883 in March 1995. Current employees serve in following categories: full-time and limited-term UC, contractor, and change-of-station personnel; and graduate, undergraduate, and high-school students. Contractors make up 23% of the Division's total workforce. Figure 1 depicts ESH employees by organization: The two largest groups are Health Physics Operations (ESH-1) with 19% of our workforce and Industrial Hygiene and Safety (ESH-5) with 11%. Degrees held by the ESH technical staff members (TSMs) are illustrated figure 2 on the next page. Of the 224 TSMs in the Division, 94% have a technically based degrees (B.S., M.S., doctorate, M.D., or D.V.M.), and 77% have technically based graduate degrees.

All ESH Division employees commit to Laboratory excellence in science and technology. This commitment is stated in the Division's vision, challenge, and principles (appendix A), which set the standards by which we conduct ourselves within the Laboratory and throughout the DOE complex.

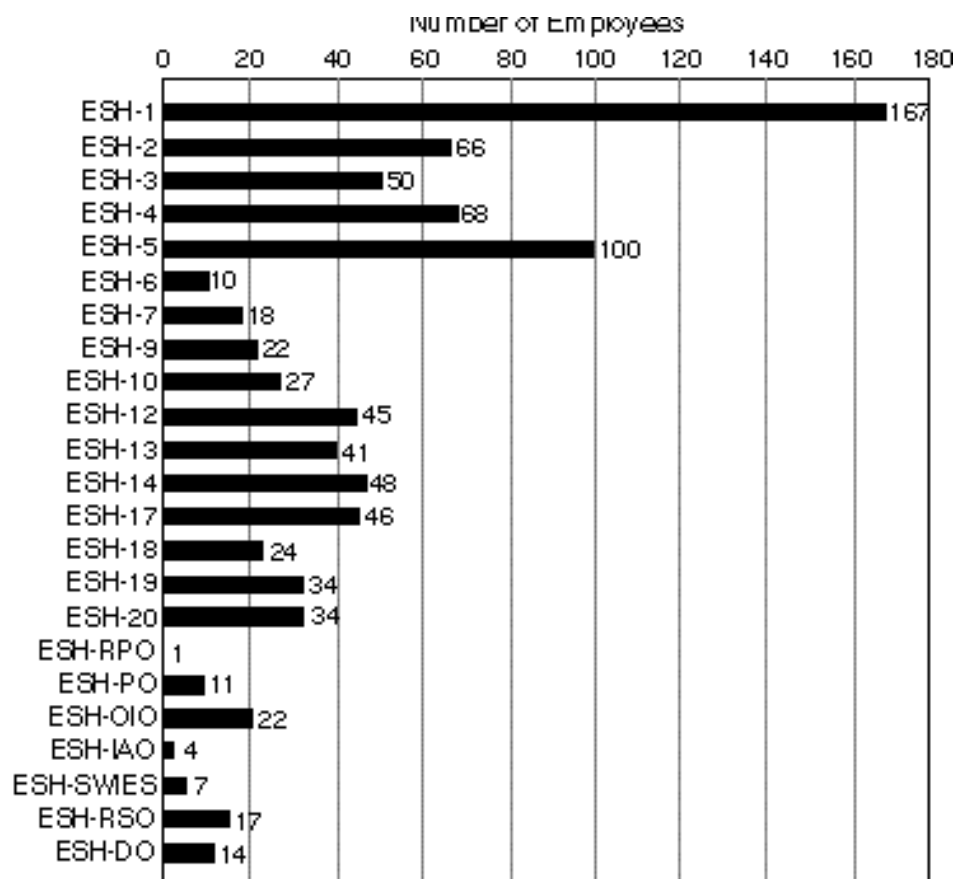


Figure 1. ESH Employment by Group

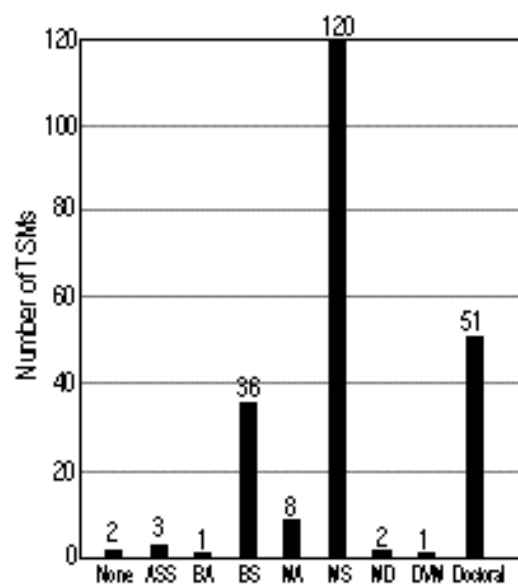


Figure 2. Technical Staff Members by Degree
(Total TSMs = 224)

CRITERIA 1

QUALITY OF SCIENCE AND ENGINEERING

Performance Measures:

- Areas of excellence and strength
- CY95 peer-reviewed publications
- CY95 publications in proceedings
- CY95 Los Alamos (LA) reports
- Memberships in professional societies
- CY95 honors, awards, and elections to national science and engineering societies
- CY95 contributions to science education
- Fellows in a professional organization
- CY95 presentations at professional society meetings

Performance Measure: Areas of excellence and strength

ESH Division professionals have three different ways they assist Laboratory organizations in performing science, developing technology, and conducting operations:

- ES&H assistance in regulatory guidance and surveillance for project documentation and work safety;
- Technical partnering with organizations to assist in areas of technical enhancement or scientific experimentation; and
- Direct-funded scientific and applied technical research in ES&H.

All organizations within ESH Division have strengths in one or more of these areas. An indication of growth in technology development is reflected by the Division's increased number of R&D 100 submissions—three this year.

Because the operations of each organization are different and expertise is expressed through different professional disciplines, we discuss each organization's strengths separately.

The Health Physics Group (ESH-1) provides radiological support to all Laboratory organizations that use radionuclides, x-ray-generating devices, and accelerator facilities. The group is recognized by DOE for having one of the strongest applied health physics programs within the complex. This reputation is based upon such programs as follows:

- program development for radiological control technicians;
- assistance to the Stanford Linear Accelerator Center; and
- expertise in the area of spectroscopy to characterize the actinide purification process and its relationship to waste streams.

ESH-1 is assisting DOE in environmental restoration projects. The group is also helping to establish decontamination and decommissioning (D&D) standards and techniques, thereby contributing to consistency in D&D activities and more reliable operations that support D&D technologies.

The Occupational Medicine Group (ESH-2) provides medical surveillance to all Laboratory employees. In monitoring the health of Laboratory employees, the group provides quality assurance that assists managers in determining if Laboratory safety mechanisms are in place and effective. The result is a health-trending program based upon changes in an individual employee's base health profile. Working with the Industrial Hygiene and Safety Group (ESH-5), ESH-2 has developed a program that facilitates information flow for more effective management of employee safety.

The Division's health-trending program has received considerable recognition from DOE Headquarters. Dr. Tara O'Toole is using the expertise of Dr. Jerry Williams and Barbara Hargis to develop the program and to encourage other DOE facilities to adopt concepts applied at Los Alamos.

The Facility Risk Management Group (ESH-3) has further developed the ES&H Identification Process (ESH-ID). The system includes a laptop computer that enables the customer to take the ID process to the field, where it helps them identify potential ES&H and regulatory issues associated with future projects. The ESH-ID program is a planning tool that can identify DOE requirements and National Environmental Protection Act (NEPA) issues that have potential to impact a project.

ESH-3 has excellent technical competence in risk assessment and risk analysis. DOE is using ESH-3 personnel to assist them in the review of other facilities' technical and analytical safety analysis. This includes assisting DOE Albuquerque (DOE/AL) in enhancement of the Safety Analysis Report (SAR) review process and assisting other DOE contractors, such as Pantex, in establishing an acceptable process for risk assessment and risk analysis in SAR preparation. The SAR review process establishes the requirement and the process to obtain approval from the various regulatory agencies.

ESH-3's Facility Review Team is one of 15 statewide recipients and the first Laboratory organization to receive a Baldrige New Mexico Quality Roadrunner Award this year. The award acknowledges organizational excellence and the commitment and implementation of quality principals in building sound and notable work processes; it is an objective measure of an organization's performance— leadership, information management, strategic planning, human resources, process management, and customer satisfaction.

The Health Physics Measurement Group (ESH-4) has several patents that apply to their continuous air monitor (CAM) technology, which is primarily used for plutonium and uranium operations. The instrument provides state-of-the-art detection of airborne alpha-emitting radionuclides and is currently being placed into operation at Technical Area (TA-55) and the Chemistry and Metallurgical Research (CMR) Building. Also, the CAM has been transferred to industry for commercialization.. Several aspects of this was a collaboration with Texas A&M University.

In progress:

- Extending the design of the CAM for use as an environmental monitoring instrument;
- Development of a neutron dose rate rem meter (submitted for an R&D 100 award), and
- Additional developments in personnel and high-energy neutron dosimetry.

The Industrial Hygiene and Safety Group (ESH-5) continues to maintain its leadership role in supplied-air-suit and permeation testing. The research and development team has further developed its heat stress monitor, which provides remote detection of excessive heat stress levels for workers. An excellent worker protection device, the monitor will reduce costs associated with operations that might involve heat stress by managing the use of personal protective equipment and the resulting heat stress suffered by workers. The team is continuing to work with commercial organizations to develop more advanced remote-metering technology. ESH-5 has proposed to DOE Headquarters (DOE/HQ) that an organic vapor monitor be developed that will provide remote readings for hazardous waste worker exposure.

The Nuclear Criticality Safety Group (ESH-6) provides leadership and guidance to all Laboratory programs involving fissile material. Working with DOE, other DOE facilities, and the Department of Defense (DoD), they assist in developing operational procedures, reviewing new operations, and training personnel. Criticality guidance is provided to the DOE and DoD on developmental, stockpile, and retired nuclear weapons.

Within the last year, ESH-6 staff have assisted Westinghouse Hanford, Rocky Flats, Westinghouse Savannah River, DOE/HQ, Oak Ridge National Laboratory, the Oak Ridge Y-12 Plant, and the Nuclear Regulatory Commission (NRC) on criticality issues. ESH-6 also provides criticality guidance to DOE and DoD on developmental, stockpile, and retired nuclear weapons.

The group has developed unique, hands-on training courses at the Pajarito Site facilities. Over 2000 federal and contractor personnel have attended their two-, three-, and five-day criticality safety training classes. Members of the group are involved in development of national and international criticality safety consensus standards.

Occurrence investigation and reporting (ESH-7) is a major area of interest as the Division responds to DOE Order 5000.3B and DOE's Lessons-Learned Program. The Occurrence Investigation Group (ESH-7) assists DOE/HQ in regulatory development and dissemination of investigation training programs to other DOE sites and contractors.

ESH-7 has provided mentoring and reporting assistance to Pantex and Battelle Hanford. DOE has used ESH-7 occurrence investigation personnel at Lawrence Berkeley and Lawrence Livermore.

The Standards and Calibration Group (ESH-9) excels in the use of state-of-the-art methods and equipment to conduct unique scientific measurements that support various scientific and technological programs throughout the Laboratory. A prime example is the group's capability to do three-dimensional measurements (within a few millionths of an inch) of large solid volumes. They are among the leaders in the DOE community in voltage measurement capabilities.

The Hazardous Materials Response Group (ESH-10) provides emergency response to the Laboratory and the County of Los Alamos. This group includes the Laboratory's Radiological Assistance Program, which supports DOE/AL in Region 4 (Arizona, New Mexico, Texas, Oklahoma, and Kansas). They provide worldwide deployment of health and safety personnel to support DOE's Accident Response Group (ARG) and Nuclear Emergency Search Team (NEST) programs.

ESH-10 has developed two technologies: A remote pressure relief and sampling system that samples drums and cylinders containing unknown materials (a request has been made to finalize this design for submission as a R&D 100 Award for next year); and an emergency exercise data-generating device called "Plume-in-a-Box," which automates and standardizes data during an emergency exercise or real event. This newly developed device has field utility and provides greater analytical capabilities than previously used technologies.

An ESH Division technology, Plume-in-a-Box, is one of this year's Laboratory submissions for an R&D 100 Award (one of three submitted from ESH Division).

The Policy and Program Analysis Group (ESH-12) leads DOE and the Health Physics community in internal dosimetry technology. One member of the group was selected for a five-year appointment to the Health Physics Society Standards Committee. This committee oversees the development of radiological standards generally adopted by DOE. The group developed Bayesian statistical analysis methods for application in internal radiation dose assessment. These methods reduce the number of "false positives" and lead to more accurate dose assessments.

As a result of ESH-12's work in Bayesian analysis, Westinghouse Savannah River Laboratory and other national and international organizations are interested in or have already adopted these new methods into their dosimetry program.

ESH-13, the ESH Training Group, excels in communication, as demonstrated by their ability to present complicated reports and concepts to workers and create applications relevant to their work. The team's technical skill has enabled them to recognize inconsistencies among different programs in the Laboratory and assist in correcting them. The group is recognized as a leading authority in radiological control technician (RCT) and environmental training. Their training programs use individuals involved in science and technology, which further lends credibility to their courses.

The Quality Management Group (ESH-14) is the DOE's expert organization for identifying counterfeit materials that may appear throughout the Laboratory, such as rigging equipment, bolts, nuts, computers, etc. Working with the procurement organization and various other Laboratory groups, they analyze vendor-delivered materials. The group has hosted a DOE workshop on the subject of fraud and counterfeit materials that has generated considerable interest throughout the DOE complex.

The Air Quality Group (ESH-17) played a significant role between the Environmental Protection Agency (EPA) and DOE in the Federal Facility Compliance Agreement (FFCA) for Laboratory radioactive air emissions. They have provided technical guidance in the areas of radioactive stack sampling and assisted in gaining approval for an alternative sampling method. The FFCA agreement is in final review and each organization is expected to sign in the near future. The group's unique capabilities are demonstrated in their management of the Laboratory's extensive stack-sampling systems that serve building ventilation systems and changing radioactive source terms. The Air Quality Group has successfully developed innovative permitting strategies with the New Mexico Environmental Department (NMED) regarding compliance with recently promulgated operating permit regulations.

The group is actively pursuing a reduction in a number of stacks at the Laboratory and have already been instrumental in reducing the number of sampled stacks at TA-50 from 7 to 1. This will simplify programmatic activities and reduce costs. A similar effort to reduce liquid outfalls is being performed by the Water Quality and Hydrology Group (ESH-18).

ESH-18 is responsible for the regulatory compliance of the Safe Drinking Water Act for the Los Alamos County. The group is viewed by NMED as the standards specialists and are frequently called upon to address water quality and stream standards.

ESH-18 has developed a comprehensive storm water flow model for Los Alamos canyons and has installed gauges to measure flows. The gauge system provides a mechanism to compare theoretical storm water flows to actual measured flows and to understand migration of contamination in canyons.

The Hazardous and Solid Waste Group (ESH-19) is primarily compliance oriented and recognized in the DOE community for expertise in interpreting regulations. It actively supports other Laboratory organizations in hazardous waste regulation and permitting requirements.

The Ecology Group (ESH-20) has achieved excellence in NEPA activities. DOE has granted the group limited authority on categorical exclusion (CATEX) determinations associated with general building maintenance. (CATEX determines if activities are included in previous NEPA reviews.) The group also provides management of biological systems within the Laboratory environment. ESH-20 has received a joint grant with the

University of New Mexico (UNM) Medical School through the National Institute of Health (NIH) to perform biostatistical studies on the hantavirus. This large study will identify the location of mice carrying the disease and consider data pertinent to population spread.

ESH-20 has received national and international interest in their wildlife management program. The recognition is based on their application of a collar transmitting device that sends a signal to a satellite to allow tracking and management data for large mammals.

The Planning and Management Process Office (ESH-PO) continues to develop and formalize cost-risk-benefit analysis and prioritization.

The cost-risk-benefit analysis and prioritization methods developed and formalized by ESH-PO have become a standard in many places throughout DOE and have been adopted by many DOE subcontractors and DoD. The technique is frequently being referenced in DOE and DOE contractor proposals as an expert system.

The ESH Division Operational Integration Office (ESH-OIO) provides effective Laboratory-wide operational integration of ESH methods and processes. Some of these include DOE Standards Program development, Workforce Productivity, and Conduct of Operations. They establish coordinated efforts with the DOE and the Defense Nuclear Facilities Safety Board (DNFSB).

The Institutional Affairs Office (ESH-IAO) provides an interface with both internal and external organizations that deal with ESH division. They serve as a cross-cutting office for external regulations for UC, DOE, DNFSB, other national laboratories, and industrial collaborators..

Performance Measure: CY95 peer-reviewed publications

This performance measure evaluates contributions in science and technology as reflected by publications in peer-reviewed journals. The division published 40 different documents in a variety of peer-reviewed professional journals and scientific handbooks, such as the Journal of Health Physics, the International Handbook of Evaluated Criticality Safety Experiments, International Journal of Radiation Biology, and Water Resources Research.

ESH Division published in subject matter fields related to the protection of workers and the environment, instrumentation, ES&H methods, and decision analysis. Many articles have been published on the risks associated with low doses of radiation in humans and the impact of radioactive materials on the environment. Comprehensive work benchmarking nuclear criticality experiments on a variety of nuclear materials with different reflector materials was also published.

The large number of peer-reviewed publications related to nuclear criticality is indicative of the expertise that resides in ESH-6, which is used as a national resource.

A partial list of peer-reviewed papers appears in appendix B:

Performance Measure: CY95 publications in proceedings

These works cover many of the same subject fields as peer-reviewed publications. A list of these publications appears in appendix B. In this instance the entire spectrum of ESH interests (training, radiation measurement, emergency response, criticality, and industrial hygiene) is represented by the 16 publications.

Performance Measure: CY95 LA reports

This past year ESH Division published over 90 Laboratory reports—over 50% of which relate to environmental subjects. A complete list appears in appendix B.

A major contribution was division participation in the publication of a complete issue of *Los Alamos Science* (No. 23, 1995). This volume covers radiation protection, human radiation studies, radiation effects, and risk and details DOE Atomic Energy Commission activities in human studies.

Performance Measure: Memberships in professional societies

ESH Division is represented by memberships in ninety professional organizations. A detailed listing appears in appendix B.

Performance Measure: CY95 honors, awards, and elections to national science and engineering societies

Numerous professional societies have recognized ESH Division members for excellence within their field. Some of these groups have recognized individuals through certifications. A list of awards, honors, certifications, and elected positions is included below.

R. Henderson, Award of Excellence for Significant Contribution to the Nuclear Weapons Program, LANL.

D. Derkacs, Award of Excellence, Society for Technical Communication.

L. Kreyer, DOE Nuclear Weapons Program Award of Excellence, DOE.

K. Mullen., R&D 100 Award, R&D Magazine co-author, Polymer Filtration for Selective Metal Ion Recovery.

H. Ettinger, American Industrial Hygiene Association representative to the International Occupational Hygiene Association.

R. Anderson, 1995 Laboratory Distinguished Performance Award, LANL.

S. Walker and C. Olson, 1995 Certified Health Physicists.

W. Bergquist, Certified Environmental Trainer for Occupational Health and Safety.

J. Rodgers received a patent for his invention of the quick-change filter cartridge being used in the CAM for airborne alpha radioactivity that he also developed.

C. Blackwell, elected chair, Congress Program, 1997 National Safety Council, R&D Section.

Performance measure: CY95 contributions to science education

ESH groups currently support 115 students— 12 high-school students, 67 undergraduate students (UGS), 35 graduate research assistants(GRA), and one postdoctoral fellow. We have students under the Associated Western Universities program and the Oak Ridge Institute of Science and Education Program. ESH Division supported the Historically Black College Programs by sponsoring eight students and provided support to Teacher's Opportunities to Promote Science. ESH employees serve as instructors, professors, and advisors at numerous colleges, both locally and out of state. ESH Division also supports the continuing education of its employees. At present two employees are pursuing doctoral degrees. Additionally, ESH Division has trained 72 certified RCTs. Examples of thesis activities supported by ESH Division are listed below; a list of all activities appears in appendix B.

An ESH-17 student completed a Masters of Science Thesis, "Effects of Engineering Controls on Radioactive Air Emissions from the Los Alamos Neutron Science Center," at Texas A&M University.

Veverke, P. (ESH-12), Master's thesis, "Optimization of Radiation Protection, A Review of the Development and Practice," degree awarded February 1995 from National Technology University.

Noskin, H. (ESH-19), Ph.D. thesis, "Continued Research on Surface Analysis of Sulfate-Reducing Bacteria using Rivera-Lyons, Catherine, Design of Soil Washing System to Treat Lead and Radionuclide Contamination."

Performance Measure: Fellows in a professional organization

The following ESH employees have been named to the rank of Fellow in their professional organizations:

J. Kunzman, American Association of Physician Assistants, 1982

H. Smith, American College of Preventive Medicine

M. McLain, Health Physics Society, 1993

M. McNaughton, American Physical Society, 1988

H. Ettinger, American Industrial Hygiene Association, 1994

Performance Measure: CY95 presentations at professional society meetings

ESH Division members have made presentations at many professional society meetings. Their presentations represent research and development as well as applied operations supporting Laboratory science and technology. Presenters provide significant Laboratory visibility and present new innovative technology development to their professional societies. There was a total of 91 presentations in professional society meetings. A full listing of presentations together with a list of meetings where the presentations have been made is provided in appendix B.

CRITERIA 2

RELEVANCE TO NATIONAL NEEDS AND AGENCY MISSION

Performance Measures:

- Current work and/or capabilities that are contributing to the Laboratory's core competencies
- Involvement in standards organizations, boards, or committees
- Ability to address high-priority issues in an effective and timely manner
- Support of the Laboratory's Waste Minimization Program
- Technology development, evaluation, and application (TDEA)

Performance Measure: Current work and/or capabilities that are contributing to the Laboratory's core competencies

ESH Division contributes to every Laboratory core competency by providing essential expertise and operational experience to help integrate ES&H into all programs. For example, ESH dose assessment services and radiological information management complement activities that contribute to the Laboratory's competencies in operations that involve radioactive materials.

ESH experts are involved in multiple reviews of most Laboratory-conducted experiments. During the set up for any particular experiment, we may be called upon to inspect everything from electrical equipment to heavy equipment and then also provide radiological support when the experiment is being run. Our criticality experts review experiments at CMR, Pajarito Site, and the Plutonium Facility for criticality safety.

The Division directs its technology research and development efforts toward developing improved state-of-the-art radiation detection equipment, personnel dosimetry measurement instruments, and radiological procedures that support a wide variety of Laboratory programs. The scientists and technicians that work within the Laboratory's core competency areas depend directly upon ESH expertise for hazards analyses during planning and for pre-emergency planning, to assess emissions, and investigate unusual occurrences.

Earth and Environmental Sciences and Nuclear and Advanced Materials. ESH monitors outfalls and checks for water contamination in the Los Alamos area. Our NEPA reviews enable technical staff members throughout the Laboratory to begin new processes and activities while remaining within environmental laws. Each year, ESH generates the Laboratory's environmental surveillance report. This report assesses external radiation levels, airborne emissions, liquid effluents, and chemical and radionuclide concentrations in ambient air, surface and ground water, municipal water supplies, soils and sediments, and foodstuffs. These data are used to evaluate environmental effects from Laboratory operations and reveal that environmental effects from Laboratory operations are small and do not pose a threat to workers, the public, or the environment. Subject matter experts within

our Division provide direction to activities that emit radiological and/or hazardous/toxic materials.

Bioscience and Biotechnology. ESH Division is collaborating with NIH to perform biostatistical studies relative to transmission of hantavirus. Advances in radiotelemetry are being applied to track elk within the environs of the Laboratory. Scientists capture and then collar elk with a transmitting device that sends signals to a network of satellites. Information about the location of elk will be used to study their movement patterns and to control elk populations.

Modeling. ESH staff are modeling room configurations and sampler locations at the Plutonium Facility to determine air-flow patterns and potential radiological hazards that could result in worker exposure. Health physics principles are being used to create models that demonstrate the most effective methods for air sampling should an airborne release of radioactive material occur and workers need to be notified. ESH assists in criticality modeling for the nuclear weapons stockpile program.

Performance Measure: Involvement in standards organizations, boards, or committees

ESH Division employees are members of standards organizations, boards, and committees that provide the information basis for DOE orders and federal and state regulations. Through its presence in these organizations, ESH Division provides input in developing and maintaining significant scientific standards that are in an area that needs greater involvement from ESH Division and various Laboratory organizations. ESH has opportunities to review and develop regulations that directly affect the Laboratory. We coordinate input from our Laboratory and other organizations that have expertise in the area in which the standard is being reviewed or developed. These include DOE orders and regulations, ISO standards, ASTM standards, ANSI standards, and Health Physics Society Technical committees. All of these standards and regulations provide an operating ES&H rationale for Laboratory science and technology. Appendix B contains a list of ESH employees that are active on standards committees. Major areas of involvement are radiation protection, dosimetry, respiratory protection, air sampling, and nuclear criticality.

Performance Measure: Ability to address high-priority issues in an effective and timely manner

ESH division has addressed many high-priority issues that arose during the past year. Some of the issues that were considered high priority are as follows:

- educating managers/supervisors on how to deal with violence in the work place;
- developing one operation permit for the entire Laboratory which meets the new clean air act requirement;

- determining more accurate neutron dose correction factors for the high-dose workers at TA-55;
- instituting and maintaining the suspect counterfeit parts program;
- assisting with Laboratory reengineering teams;
- deploying of ESH employees to partner with Laboratory operations;
- verifying the Laboratory's implementation plan for 10CFR835, the Occupational Radiation Protection Codified Standard; and
- improving the quality of the internal dosimetry program.

ESH Division responded to a variety of high-priority issues that appeared as unusual events and occurrences in the past year. We responded to 45 HAZMAT incidents and 800 unusual events—approximately one-third required follow up and formal reports. The Division maintains personnel on call should an unusual occurrence or event occur during off hours.

Performance Measure: Support of the Laboratory's Waste Minimization Program

ESH Division has been successful in assisting in the implementation of new ideas and improvement of the existing waste minimization program. ESH has incorporated waste minimization and pollution prevention in a variety of their training courses. A Laboratory-wide chemical inventory system (ACIS) is maintained to provide organizations a means of quantifying and locating existing chemicals to avoid unnecessary additional purchases, thereby lessening the overall inventory of hazardous substances.

We assist organizations in determining new waste minimization and pollution prevention opportunities, such as providing advice on nonhazardous and alternative materials. ESH Division supports the waste minimization program through water conservation and outfall reduction efforts. On-line policies, procedures, and standards are provided to groups through the Laboratory computing system. ESH is participating in a joint DOE/Commercial Nuclear Power Plant Health Physics Committee chartered to define, characterize, and develop health physics practices aimed at waste minimization for potential application throughout DOE and commercial nuclear power programs.

ESH Division has been supporting waste minimization efforts in environmental restoration and D&D projects throughout the Laboratory. We characterize waste early, thus minimizing additional waste. ESH is assisting CST in the characterization of wastes that are being exhumed and readied for final disposition. ESH is investigating and implementing state-of-the-art technology such as custom containment manufacturing and improved instrumentation for waste characterization and quantification. Commercial compaction and other waste minimization technologies have also been introduced to the Laboratory and implemented in the waste minimization program.

Performance Measure: TDEA

The public expects that Laboratory operations will not result in negative ES&H impact. The Laboratory and the DOE must achieve this goal within budget by developing new technologies and implementing innovative approaches that cost effectively improve ES&H protection.

In FY95, ESH Division initiated TDEA, allocating <1% of its annual budget to developing technologies that would ameliorate Laboratory ES&H problems. TDEA priorities are as follows: The program must

- benefit Laboratory workers and the public;
- support Laboratory mission objectives;
- respond to unique expertise and requirements at the Laboratory;
- achieve success within three years;
- and transfer technology to other DOE sites.

TDEA's focus on the Laboratory's needs and on problem solving makes the program noncompetitive with the Laboratory-Directed Research and Development Program.

In FY96, the Division is supporting seven small projects (<\$100 thousand each for a total program cost of \$400 thousand) in neutron dosimetry, exposure assessment, engineering controls, personal protective equipment, and environmental impacts. Early accomplishments include improving methods for estimating worker neutron exposure; evaluating the effectiveness of exposure assessment using CAMs; identifying effective CAM sampling locations and collaborating with commercial organizations regarding preparation and testing of new protective gloves.

Because funding for this effort was initiated in April 1995, most projects are in their startup phase. Additional success indicators are that one project has matching funds from the Nuclear Materials Technology Division and the neutron dosimetry study has in-kind beam-time support at the Los Alamos Neutron Scattering Center. ESH Division's future plans for the program include redefining priorities with additional input from line organizations, increasing its funding to 1–3% of the ESH Division budget by FY00, and being more aggressive about seeking additional outside funding.

ESH Division expects to extend this effort to obtain Laboratory-wide line organization involvement in developing ES&H technologies. Some examples of technology development are noted below and include work funded under TDEA and other programs.

An ESH-4 employee has been awarded three patents for development of a CAM, which has been commercialized by Canberra Nuclear. This instrument is being used as the primary alpha particulate air-monitoring instrument at the TA-55 and CMR facilities. Experimental design and development of an environmental version of the CAM is in progress. A prototype is currently being evaluated in the field and considerable interest in the project has been shown by other DOE organizations. ESH-4 has also developed a new neutron radiation dose instrument, which is the first development in over two decades. This Wide-Energy Neutron

Dosimeter Instrument (WENDI) development has been completed and a supplier for this high-energy neutron dose instrument is being sought.

Several developments in personnel dosimetry are in progress.

A new dosimetry badge accurately measures personnel neutron exposures. The results indicate that in some instances neutron exposures have been over estimated in the past by as much as 55%.

ESH Division has taken the lead in development of a nuclear accident and a high-energy neutron dosimeter. We are working with the Advanced Nuclear Technology Group of the Nonproliferation and International Security Division to acquire the Health Physics Research Reactor from Oak Ridge to support sophisticated radiological research.

ESH Division continues to be a DOE resource for personal protective clothing consultation and technology development. We provide the DOE testing capability for supplied air suits and hazardous material suits. We have developed a heat stress monitor that is undergoing commercial development. This worker protection device can potentially reduce the need for excessive clothing and remotely provide information regarding a worker's stress condition in a hazardous atmosphere. A portable organic vapor sampling device is in early stages of development. It provides remote information to evaluate hazardous waste worker exposure. The Industrial Hygiene Research Team evaluates the effectiveness of various kinds of filtration media including High-Energy Particulate Air filters for nuclear facilities and respirator filtration cartridge for protection against particles and vapors.

The Water Quality Group has developed and installed 17 water gauging stations in the major canyons of Los Alamos County. These devices measure surface water at the site of generation and downstream. Through the use of automatic gauging and recording devices, the group can control and balance the water that leaves Laboratory property, an application that extends to automated control of storm water.

ESH Division pursues the research and development of new emergency response equipment such as the "Plume-In-A-Box," which allows real-time data analysis during emergency exercises/events. This device has been submitted for consideration of this year's R&D 100 Award.

Development of a device that releases the pressure from a cylinder or a drum has been ongoing during the past year. Further development and refinement will be ongoing throughout this year.

ESH-20 is field testing an advanced radiotelemetry system to track mammals. To date five cow elk have been captured and fitted with collars carrying a state-of-the-art global positioning system that transmits signals to a satellite. Data transmitted from satellites back to earth will assist scientists and wildlife game management evaluate migratory patterns and eating habits of elk. This group is also being funded by NIH with UNM to study the geographical location of mice carrying hantavirus. Information and data obtained from this study will eventually contribute to control of the disease caused by the virus.

Bayesian statistical analysis methods have been developed for applications in internal radiation dose assessments. The accuracy of internal dose measurements has been increased and the improved methods for internal dosimetry study are being used by other organizations throughout the United States and internationally.

CRITERIA 3

PERFORMANCE IN THE CONSTRUCTION AND OPERATION OF MAJOR RESEARCH FACILITIES

Performance Measures:

- Design assistance in renovation and upgrading of existing or new facilities
- NEPA support in ESH-ID, CATEX, environmental assessment (EA), or environmental impact statement (EIS)
- Operational readiness and review and development of safety analysis reports
- Operational support of ESH disciplines to a facility or operation

Performance Measure: Design assistance in renovation and upgrading of existing or new facilities

Organizations in ESH Division provide significant contributions to upgrading existing facilities and new facility design. By reviewing facility design early, involved ESH groups, ensure that ES&H systems and are in-place and operational and that facility configuration supports operational safety and complies with DOE orders and state and federal laws and regulations. ESH organizations also provide experience and guidance in the design of facility subsystems and guidance for design of major facilities at other DOE sites, such as the Consolidated Nuclear Materials Storage Facility. The Radiological Engineering Team provides significant support to the design modifications for TA-55, the Nuclear Material Storage Facility, the CMR Building, and for any facility using nuclear material or radiation-generating devices.

ESH Division is involved in new facility design in several ways. To ensure safety and hazard analyses have been accomplished, ESH-3 interfaces with the planning and scheduling of new design concepts. ESH follows the construction process from beginning to end using subject matter experts to provide health and safety guidance and assistance in the appropriate disciplines. Currently, ESH has deployed a nuclear engineer to FSS's Facility Project Delivery Group to support project managers during the design phase. ESH Division assists in the modeling of waste drains, piping, water supply, and backflow prevention. An example is participation in the Sanitary Wastewater System Consolidation Project design and in the construction of the High-Explosive Waste Water Treatment Plant. The NEPA component of ESH Division conducts environmental assessments, archeological studies, and endangered species evaluation before any new construction begins.

The Division provides radiological assistance for the handling of fissionable materials and provides design input on criticality issues dealing with storage and transportation of fissile material. Radiological assistance is exemplified by our support on a DOE EM-37 effort researching DOE's spent nuclear fuel storage and disposal options. ESH performs design reviews for new construction and renovation of existing facilities to evaluate radiological concerns and provide RCT support on upgrades of existing facilities. We

provide input to the construction, design, review, and approval of technical work documents.

Performance Measure: NEPA support in ESH-ID, CATEX, EA, or EIS

ESH subject matter experts provide information and analysis of existing data to the Site-Wide Environmental Impact Statement (SWEIS) Team. Examples of this support are the unique expertise we provide in chemical and environmental analysis through ESH-3 and hydrology data evaluation by ESH-18. These and other data are transferred through DOE/AL to the SWEIS subcontractor.

The ESH Division Ecology Group (ESH-20) deploys a full-time NEPA Team to assist other Laboratory organizations in NEPA activities. This team has recently been given limited authority by DOE to make CATEX determinations associated with general building maintenance. This is significant because it eliminates long delays in obtaining DOE approval on maintenance or repair issues that could disrupt operations. This and other methods have been developed by the Ecology Group to reduce NEPA preparation time and thereby reducing cost. They also perform environmental, archeological, and biological studies. Initiation of the NEPA process frequently occurs because of ESH-ID review of work orders and job. ESH-ID also initiates the need for ESH Division to provide radiological and industrial hygiene support data for Laboratory NEPA documents. The Radiological Engineering Team supports the NEPA program by reviewing ESH project summaries through the ESH-ID process. To ensure that environmental impacts, such as air emissions, are incorporated in facility modification or new process design, ESH-17 reviews preliminary and final designs.

Performance Measure: Operational readiness and review and development of safety analysis reports

ESH Division develops and review of SARs and operational readiness reviews (ORRs). As new programs develop or new facilities are built, ESH Division interfaces with organizations from conception to design, commissioning and final operation. We partner with various Laboratory organizations to assist in hazard analysis, preliminary and final SAR writing, and ORRs to establish final DOE and frequently Defense Nuclear Facility Safety Board (DNFSB) approval for operations. We often have the only individuals in the Laboratory with the expertise to write SAR sections dealing with specific ES&H disciplines.

ESH contributed to writing sections of SARs and Technical Safety Reviews (TSRs) for TA-55, CMR, the Critical Assemblies Facility, Radioassay and Nondestructive Testing Facility, and the Weapons Engineering Tritium Facility (WETF). We also provide the final review of all SARs before they are submitted to DOE/AL. This active involvement in SARs and understanding of projects provides value to the Laboratory by our participation in ORRs and commissioning. ESH-3 has the ultimate responsibility for the

Laboratory's ORR institutional process and develops the associated standards and training program. Examples of our recent ORR participation are TA-54, WETF, and the 1995 accelerator startup.

Our leadership and guidance has led the Laboratory to near completion of SARs for all existing nuclear facilities— the first time the Laboratory has this level of formality for its nuclear facilities. The Division partners with organizations to perform hazard analysis of experiments, operations, or equipment development. Examples of this activity include calculation and analysis of the AT-400 Pit Shipping Container for certification and the TA-53 accelerator production of tritium concept. The AT-400 Pit Shipping container analysis is being performed in conjunction with Lawrence Livermore's SAR for Packaging. The Accelerator Production of Tritium will begin conceptual design in late FY96 and ESH Division will assist in engineering design and experimental development.

Performance Measure: Operational support of ESH disciplines to a facility or operation

ESH Division partners with other Laboratory organizations to maintain the continuous operations of facilities and science- and technology-based programs. ESH Division has members assigned to groups or on call that provide assistance essential to the timely and safe completion of experimental or operational activities. The partnering concept integrates ES&H with the science and technology program issues, requirements, and objectives. The major facilities and operations supported by ESH Division are TA-55, CMR, WETF, TA-21, and various D&D operations throughout the Laboratory complex.

Because operational support functions are integral to the performance of science- and technology-based activities, ESH Division partners with the operational groups to resolve ES&H issues and their impact upon various programs. ESH personnel are frequently permanently assigned to and located at a facility or organization. In facilities or operations where continuous support is not necessary, assistance is provided as the need arises. ESH Division emergency response capabilities in major ESH disciplines are available at all times through Laboratory Security's call-out system.

We provide emergency response functions to assist groups in mitigating unusual occurrences and accident situations. ESH Division's HAZMAT Response Team provides expertise in all aspects of health and safety, including a comprehensive occupational medicine program to support emergencies. This team remains ready at all times to respond to emergencies that might occur at the Laboratory.

CRITERIA 4

PROGRAMMATIC PERFORMANCE AND PLANNING

PERFORMANCE MEASURES:

- All work packages reviewed to evaluate the effectiveness and efficiency of processes, products, service, schedule, and budget
- Teams deployed (in response to reengineering and workforce productivity initiatives)
- Management strategic and tactical plans updated
- Health and safety customer survey followed up

Performance measure: All work packages reviewed to evaluate effectiveness and efficiency of processes, products, service, schedule, and budget

ESH Division is essential to the safe performance all Laboratory operations. The Division reviews numerous processes and activities associated with the Laboratory's conduct of scientific research and technology. Each group within the Division provides expertise valuable to the Laboratory's overall ES&H.

ES&H subject matter experts review processes to provide customers with professional technical evaluations of a variety of work packages. For example, an ES&H evaluation may require field work, call for contract reviews, call upon the ESH-ID process, or involve a safety analysis report. All ESH-conducted review processes are critical paths to ensure the Laboratory's safe operation.

Numerous groups within the Division support ORRs, which ensure safety and compliance with rules and regulations before an operation begins. ESH Division personnel participate in ORRs for D&D, and environmental restoration projects. The Nuclear Criticality Safety Group (ESH-6) reviews all Plutonium Facility procedures, CMR Facility operations, and all experiments conducted at Pajarito Site.

To determine controls and organizational support needed for radiological work, ESH Division reviews all work packages, small job tickets, standard operating procedures, and radiation work permits. ES&H subject matter experts identify controls based upon the type and magnitude of potential hazards, personnel involved, scope of work performed, effectiveness of proposed mitigating actions, and completion schedules. When possible, Division personnel accommodate schedules and budgets, while ensuring no significant hazards or compromises exist to negatively affect worker and public ES&H.

Most ESH groups are involved in some aspect of ESH-ID. The ESH-ID process provides a structured means to address all potential ES&H concerns, ranging from a project's impact on the historical record to its potential for environmental releases and waste generation.

Performance Measure: Teams deployed (in response to reengineering and workforce productivity initiatives)

For ESH Division, the deployment concept has evolved naturally and the Division is becoming increasingly deployed. Current reengineering efforts have emphasized deployment and increased the Division's overall efficiency and ability to support other science and technology organizations. The entire deployment concept and ESH Division's transformation to this new organizational concept will deliver assistance, support, and service to ensure that all aspects of science and technology can be accomplished cost-effectively, faster, and safer.

This year, ESH Division has taken a proactive position regarding the deployment of its services—teams with ES&H expertise are currently being deployed to various facility management units. As a pilot project, ESH Division has deployed core teams to support ESA, CST, and FSS Divisions. The teams have been very successful, leading the way for several more core teams to be deployed. In the future, various members of these teams or the entire team may be permanently assigned to the organization or facility that they are supporting. In this capacity, they will be more effective in meeting ongoing customers needs. The number of deployed ES&H personnel is rapidly increasing as deployed teams respond to Division reengineering initiatives and raised productivity standards.

Traditionally, ESH-1 has been a deployed organization that provides health physics teams according to the Laboratory facility management model. Service contracts are developed and implemented with facility managers for the level of radiation protection resources needed to maintain overall safety. Team members participated in Division reengineering efforts to better meet customers needs and expectations.

In addition to team deployment, ESH employee deployment takes other forms. For efficiency and to provide better support to ESH customers, several groups have set up satellite office facilities such as Health Physics Analytical Laboratories (HPAL) and established cubicles-of-convenience. Most groups also have individual personnel permanently assigned to a facility. The Division currently assigns personnel to FSS, Nuclear Materials Technology, Accelerator Operations and Technology, ESA, Dynamic Experimentation, CST, Computing, information, and Communications, Materials Science and Technology, Nuclear Proliferation and International Security, and Business Operations Divisions. Groups also provide on-call support,

Performance Measure: Management strategic and tactical plans updated

ESH Division has become increasingly more active in planning for the future and coordinating its goals with those of the Laboratory. The ESH Planning and Management Processes Office (ESH-PO) helps ensure that the efforts and objectives of the Laboratory, DOE, UC, and ESH Division are in concert with one another. ESH-PO leads in the coordination of responsibilities to develop and maintain ESH Division's Tactical Plan, ES&H Management Plan, and other management and program plans. ESH-PO also

develops and implements management processes for the ESH Division, which allow managers to cost and prioritize their work and accurately track the status of their programs. These processes include issues management, strategic/tactical planning, work package prioritization, technical baseline development, project management, and performance-based metrics.

Recently, ESH Division completed for DOE the Budget Formulation Information portion of the ES&H Management Plan for FY98-FY02. This plan is an important planning and budget support document and a specific requirement in Appendix F of the DOE/UC operating contract. The plan defines risk-based priorities and identifies optimum allocations of constrained resources. In addition, it describes all Laboratory ES&H activities funded by indirect (Laboratory overhead funds), programmatic (direct DOE funds), and reimbursable (work-for-others) funds. The plan comprises activity data sheets prepared by program managers, facility managers, and line managers. Activity data sheets describe ES&H activities, milestones, and funding profiles for each program and/or facility. Priorities for these activities are set on a cost-risk-benefit basis and are periodically reviewed with DOE representatives.

Other accomplishments include the development of ESH Division's FY96 Tactical Plan and development and implementation of an issues management process. The FY96 Tactical Plan for ESH Division includes specific goals and performance measures for groups within ESH Division. Quarterly reviews assess progress towards defined goals and performance measures and to help ensure that ESH Division's efforts are aligned with Laboratory-wide tactical goals and initiatives.

ESH Division is currently implementing an issues management process to identify, prioritize, and appropriately manage issues facing the division. The issues management process collects all issues that impact ESH Division's work, filters trivial and invalid issues, evaluates and establishes priorities for the remaining issues, and develops resolution strategies for disposition of these issues. The issues management process will be based on a modern software and network system and will provide a consistent process by which issues are managed and communicated in the Division.

Figure 3 shows ESH Division's structured management process for addressing ES&H at the Laboratory. It includes issues management, strategic planning, work package prioritization, technical baseline development, project management, and performance-based metrics. This process is approximately 60% implemented.

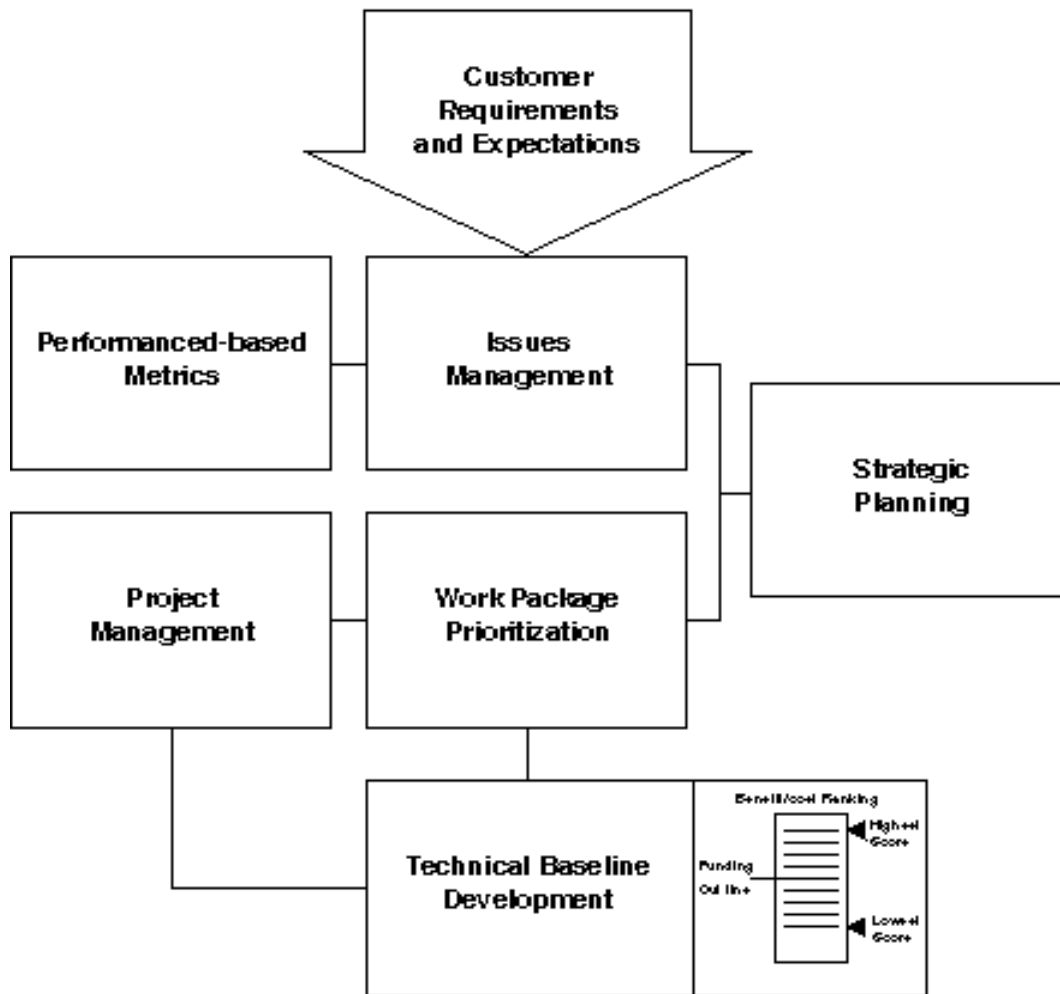


Figure 3. ESH Issues Management Process

Performance Measure: Health and Safety Customer survey followed up

As part of the 1995 Science, Technology, and Support Activities Self-Assessment, the Division conducted a customer survey of health and safety programs. Some follow-up actions are noted below.

Addressing needs of internal customers. Three major efforts to better address the needs of internal customers were initiated. The first was DOE's Necessary and Sufficient standards development process; the second was a direct effort to contact ESH customers and determine their needs for radiation protection performance data; and the third was initiation of an ESH Division reengineering effort to determine the level of ESH support that is appropriate.

The Necessary and Sufficient process is designed specifically to bring those who actually perform the work of the Laboratory together with ESH specialists and DOE in a team environment to select and/or develop applicable "standards"

needed to ensure that hazards are appropriately controlled. In this way, line organizations are part of the standards-setting process. In the past, line organizations have not been adequately involved in the development and selection process. During this year, a pilot (radiation protection) of the Necessary and Sufficient process was completed successfully.

Similarly, line organizations have been expected to perform and to continuously improve their performance relative to UC contract performance measures developed by ESH specialists. This year Laboratory line organizations provided input and new customized data reports were developed. This provides more timely response because the data are available to the customer promptly. Customer response has been uniformly favorable.

ESH Division reengineering is in progress and will involve greater deployment of ESH staff to line organizations.

ESH Division cost control. Radiation protection services are being moved to a recharge basis. RCTs are now being recharged and dosimetry services are in the process of being converted to recharge. Radiological engineering and As Low As Reasonably Achievable services are also partly recharged. We believe that costs will be reduced through line manager partnering with ESH Division.

Greater involvement of line organization staff and/or managers in policy and standard-setting process. The above discussion about serving customer needs addresses this issue regarding line management's involvement in setting Necessary and Sufficient standards together with radiation protection and serving as the pilot evaluation.

Timeliness and quality of dosimetry reports are lacking. A Dosimetry Process Improvement Team was formed to address this subject. Significant improvements introduced include clarifying the need for monitoring the process, making data available electronically, evaluating the recharge option, and testing extended monitoring periods.

Timeliness of routine health physics sample reps is lacking. HPAL results are now available electronically.

A similar customer survey of the Division's environmental programs was performed during the spring of 1996. This data is limited, and additional data may be required. Final results will be summarized as a separate report to the ESH Division Director during the last half of CY96.